

# **MIT'S UPGRADES ALTAIR 680**

As with the Altair 8800, customer demand for the Altair 680 has far exceeded MITS' expectations. As a matter of fact, the Altair 680 may very well sell as well as the Altair 8800. Due to this demand and to delays in initial shipment, MITS has decided to immediately upgrade the Altair 680 to its second generation design. This means that the Altair 680 will now include the following items at no additional cost:

- 1) PROM monitor. 1702A PROM monitor chip programmed so that you can immediately load and run paper tape object programs such as the text editor and assembler (see below).
- 2) Asynchronous Communication Interface Adapter (ACIA). Allows the machine to transmit and receive a character at a time rather than one bit. Minimizes software

needed for I/O routines. Contains crystal clock for baud rate synchronization. User-selectable for RS232, Baudot, TTL, 20ma or 60ma current loop. Baud rates of 110, 150, 300, 1200 and 2400.

- 3) A two pass resident assembler and text editor will be available for assembly language programming. This software is compatible with Motorola's format for assembly language programs, text and object files. 8K bytes of memory is required to run this package. The assembler produces a full assembly listing on the second pass, including the hex codes for the location counter and the instruction mnemonics. A symbol table listing is also produced. The text editor has full capabilities for text editing, including line insertion, printing, deletion and modification; as well as commands for changing one string of characters

to another and for searching the text buffers for a particular character string.

- 4) A BASIC interpreter is under development which will be compatible with the 8800 8K BASIC interpreter.

Although delivery dates will be set back by 30-60 days, the upgraded version will give Altair 680 users a lot more computer for their money. The features that have been added to the upgraded version will greatly enhance the design and capability of the 680 as it was first introduced in Computer Notes, October, 1975.

For the hobbyist, the Altair 680 is still the lowest-priced, most versatile kit of its kind. For industrial dedicated-program applications, the Altair 680 "turn-key" model offers reliable computer power at a compact size and compact price.

For those of you who haven't been introduced to the Altair 680 yet, you'll want to check the following specifications:

- Parallel 8-bit word/16-bit address processor
- Built-in 1K RAM
- Built-in provision for 1K PROM/ROM
- Built-in I/O port
- Case size: 11 1/16" wide  
11 1/16" deep  
4 11/16" high
- Space for up to 4 boards
- 72 executable machine instructions  
(variations up to 197)
- Price: \$345 kit  
\$420 assembled

# COMPUTER NOTES

JANUARY, 1976

VOLUME ONE ISSUE SEVEN

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A PUBLICATION OF THE ALTAIR USERS GROUP

# ALTAIR CONVENTION SET FOR MARCH 27-28

The First Annual World's ALTAIR COMPUTER CONVENTION has been definitely scheduled for Saturday and Sunday, March 27 and 28 at the new MITS building in Albuquerque, New Mexico.

In addition to many demonstrations and the official unvailing of the new Altair 8800B (see Ed Roberts' column), there will be at least 4 programs presented during this weekend. These programs include a presentation of the new MITS Traveling Seminar, a seminar conducted by MITS engineers and software writers, a meeting of the Altair User's Group, and a seminar on the home computing field in general.

This last seminar will feature some of the leading personalities in the home computing field. Included are Larry Steckler, technical editor of Radio Electronics, Carl Helmers, editor of Byte magazine, Art Childs, editor of Interface magazine, David Ahl, publisher of Creative Computing, Ward Spaniol, president of the Southern California Computer Society, and Terry Silver, also of the SCCS.

The convention will be free to all out-of-town guests. For more information, read Barbara's column and also see the ad in this issue.

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SEE YOU AT THE CONVENTION!

## Across the Editor's Desk

by David Bunnell

### Moving, Moving, Moving

This morning I went over to production to talk to one of the technicians and production wasn't there. Seems that the move is on.

Working at MITS this past year has been quite an experience. In January of 1975 we had 20 or so employees and occupied two bays in the Cal-Linn Building and it seemed that we had more than enough space.

Well, the situation now is that we occupy several bays of the Cal-Linn. If you're in engineering and you need to talk to someone personally in software, you have to go out the front door of MITS, walk some 300 feet to the end of the building, turn the corner and it's the last door on the right. This is a pleasant little stroll when the weather is nice and a miserable mad dash when it isn't.

The plan is this: production, shipping, repair and the stock room all will move during the third week of January. The rest of MITS will move during the first week of February. Hopefully, while you're reading this issue of Computer Notes I'm sitting in my new office. (Admiring the decor, no doubt.)

### The New Building

I took my first tour of the new location last week, and I must say it was impressive.

As a good journalist, I should be able to report to you the total square footage and other such pertinent statistics (how high the ceilings are?) but unfortunately I forgot to ask anyone.

Let me just say that compared to where we are now, the new place is huge. And the nicest thing about it is that the building was actually an empty shell so we were able to design all the offices, production rooms, etc., to correspond to the work flow. This means that we should be able to double and triple our production during the next few months.

The new MITS building, as reported in the last issue of C. N., is located by the Albuquerque Airport at 2450 Alamo SE.

### Letters, Phone Calls

You can begin addressing your correspondence to MITS at 2450 Alamo SE, 87106. Actually, it won't matter too much as MITS will be receiving mail at the old address for several months to come.

As for phone calls, the 505-265-7553, 262-1951, and 262-1952 numbers will be transferred to the new building. We will also have a new rotary number which will be announced in the next issue. People calling The Agency will be notified of the new number by the operator.

### This Issue

This issue of Computer Notes has a new products slant. The Teletype offer, the new Altair 4K static, hints about the Altair 8800B, upgrading of the Altair 680, the Cyclops Camera, and the TV DAZZLER—looks like an exciting year for Altair users.

We did try to have the January issue out by January 10. Obviously, we didn't make it. Oh well, next month.

## LOCAL USERS GROUPS

Anyone interested in forming a computer club in Tennessee, please contact Kent Kersten, 711 Ronnie Rd., Madison, TN 37115

Anyone interested in joining the Canadian Computer Club should contact Mr. G. Pearen, 861 11th Street, Brandon, MB, Canada (204) 725-1079.

**IBM 5100 USERS CLUB:** Physician with 5100 would like to correspond with anyone in the health care field who is interested in using the 5100 for CAI applications, e.g., patient education. I would be willing to exchange documentation in BASIC or APL and/or start a 5100 USERS CLUB specifically oriented toward medical applications. Write:

Richard E. Easton, M. D.  
5541 Parliament Drive  
Suite 104  
Va. Beach, VA 23462  
or call: (804) 490-0124

Anyone interested in forming a Computer Group in the Albuquerque, New Mexico area, please contact Gary Tack, P.O. Box 866, Corrales, NM 87048, (505) 898-7537.

## USERS GROUP NEWS



Barbara Sims

### SOFTWARE LIBRARY PROGRAMS

We are getting more and more entries to our software contest each month. It has been suggested by one of our contributors that we ask you, the users, what type of software programs you would like to see in our library. If you have requests that you feel would be of general interest to many Altair users, please drop me a card and I'll put your software program suggestions in my column next month.

### COMPUTER NOTES

There have been many requests recently for back issues of Computer Notes. I regret to say we have only a limited amount of back issues, and are completely out of issues 1, 2, & 3.

### ALTAIR CONVENTION

A date of March 27 & 28 has been set for the Altair Convention. Two hundred rooms have been set aside at the Airport Marina Hotel for the convention. One hundred of these rooms have already been reserved by the SCCS (Southern California Computer Society), which is chartering a plane to bring approximately 200 members. Rates for the remaining 100 rooms are \$20.00 for a single occupancy and \$24.00 for a double occupancy. These rooms are available for March 26-28. If enough people respond, we plan to reserve rooms in another Albuquerque hotel. Our new plant is located within walking distance of the Albuquerque International Airport and the Airport Marina Hotel.

MITS will not accept phone reservations for the Altair Convention. All reservations must be made on official forms mailed to all members of the Altair Users Group. If you need space for demonstrating your equipment, you must reserve this space through our official forms also. If you have not received an official

—CONTINUED PAGE SIX—



# Ramblings from Ed Roberts

## PROBLEMS:

The major problem this month is the Repair Department. There is still a significant delay in cycling units that have been sent in for repair. The cycle time has improved considerably over the past few months, but we still have a long way to go. Delivery of standard products has improved enormously in the past three months, but we are still a long way from achieving the desired 24 hour turnaround. The recent holidays have caused a perturbation in deliveries which should be smoothed out during January. During the last half of January and the first half of February we are moving and this will slow some things down.

## POLICY CHANGE:

I mentioned in a previous column that we would not pre-announce products, I am changing that policy to this extent. We will continue not to nationally advertise new products until they are in production, but we will announce and discuss some of the up-coming products in Computer Notes. This change is a result of the large number of inquiries and criticisms from customers concerning this policy. Apparently, the pre-release information is needed by many Altair owners for their long-term system planning. Therefore, where feasible, we will provide preliminary information on new products that have not been formally announced. This information will be for planning purposes only and may change as the product gets closer to production.

## TELETYPE:

I personally consider the new Teletype T.M. offer to represent a major breakthrough for many Altair owners. You can now own a new Teletype which is warranted by Teletype Corporation for a price less than the price of a good used Teletype.

CRT and related terminals are certainly useful for many applications, but ultimately almost every application requires some sort of hard copy device. The Teletype is unbeatable from the standpoint of price and reliability. Due to the allocation arrangement with Teletype, you should get your order in as quickly as possible.

## POWER SUPPLY:

I have received some questions concerning my comments about power supplies in last month's Computer Notes. The total 8V transformer current available in a basic Altair is approximately 10 amps. Approximately 2 amps are available for the front panel and this is supplied by a separate transformer. The bus

transformer is rated at 8V and 8 amps, but as I stated last month, we feel that with a 4 amp load on the bus power supply the voltage margins are less than desirable and, therefore, we use a higher voltage bus transformer in systems with more than 4 or 5 cards. There are some users who actually get as much as 11 amps out of the basic Altair power supply, but this clearly represents an overload to the transformers and the systems voltages have to be marginal. As stated in the previous article, if you have purchased six or more cards from MITS, we will supply you with the higher voltage transformer and mod kit at no cost. If you haven't bought six or more cards from MITS, you may purchase this kit for \$43.00. If you wish to purchase this mod kit, order kit 88-PSM.

## 8800B:

We have received many questions about the new Altair 8800B. Let me give you a thumbnail summary of some of its features and capabilities.

The 8800B is an entirely new Altair, the control and display panels are an entirely new design and contain PROM memory. The power supply supplies 18 amps unregulated at 8 volts and the  $\pm 18$  volt supply will provide up to 4 amps.

The CPU uses all the latest IC's for processor control, e.g., the clock width is crystal controlled as well as the frequency. The output of the MPU is buffered by bidirectional Schottky buffers. The front panel is logically isolated from the system bus by an interface card. The interface card and front panel are connected by pluggable ribbon cables. The system bus has 18 slots each with a full 3/4" center. The front dress panel is a four color laminated Mylar and aluminum panel which is back lighted by the indicator LED's. The front panel switches are still high quality toggle switches, but the new switches have longer, flat handles.

Most important are the new functions available on the front panel.

### Accumulator Functions:

1. Display accumulator - displays contents of accumulator.
2. Deposit accumulator - deposit data switch register into accumulator.
3. Output accumulator - output accumulator to address on front panel.
4. Input accumulator - input to accumulator from address on front panel.

## Slow:

This is a new function which allows the processor to be single stepped at a rate of 32 instructions per second.

The user can redefine the front panel functions by simply re-programming the front panel PROM and creating a custom front panel for special applications. Probably the most important thing about the 8800B is the fact that existing Altair owners will be able to purchase a kit from MITS to upgrade their existing Altair to a B at significantly less cost than purchasing a new machine.

The 8800B is a purist machine, for example there are not any single shots anywhere in the mainframe, all front panel lines are fully buffered from the rest of the bus, special Schottky noise reduction techniques are used throughout, etc. Next month's Computer Notes will provide an in-depth article on the 8800B. Volume production on the B will begin in late February. If you would like to reserve an 8800B or an 8800B update kit, please send a note to Barbara Sims. Pricing information will not be available until mid February.

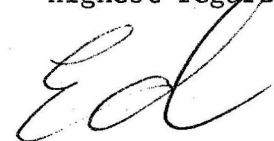
## FEEDBACK:

Your letters to me are extremely valuable, please continue to let me know your thoughts.

## DISCOUNTS:

We have in the past offered automatic discounts to customers who have previously purchased MITS products. In the future this policy will be further expanded to make sure that in addition to the many, though sometimes intangible reasons you should purchase MITS products such as software, maintenance support, single source system responsibility, etc., the price advantage for a total system from MITS will be significant.

Highest regards,



**FAST DELIVERY****TELETYPE PRICES SLASHED!**

MITS has concluded an agreement with Teletype Corporation that will allow Altair owners to purchase an ASR-33 Teletype from MITS for \$500 less than the current MITS price.

Beginning in April of this year, Teletype Corporation will set aside a monthly allotment of Teletypes\* for Altair owners. As long as orders do not exceed this allotment, deliveries are expected to be made within two weeks of receipt of order.

## CLASSIFIED ADS

FOR SALE: IBM 7090 Computer System (4 tape drives, 36 bit word, 32K core, line printer, card reader, all set up manuals, working condition)\$50K; Tektronix scopes, models 507, 511AD, 512, 517A, 551. Contact: Bruce Blevins 1600 E. Missouri Apt. 2, Las Cruces, New Mexico 88001 (505) 646-4239

FOR SALE: Southwest Technical Products CT-1024. Mainframe board with installed IC sockets, IC's, capacitors, and resistors. Less plug & sockets for plug-in cards. Memory board with installed IC sockets and by-pass capacitors. Serial I/O interface board completed board with SWTP set baud rate. For information call or write: Larry Belmontes, Jr., 1762 Vale St., Corpus Christi, Texas 78416 (512) 853-4623 Home, or (512) 853-9086 Altair's Communication Center.

FOR SALE: Tally Reader and Punch Combination-Model 420 and 424, used, good condition. \$150. Contact: L. F. Carbaugh  
PO Box 398  
New Cumberland, PA 17070

FOR SALE: Octal Pad of 100 sheets at \$2.25 per pad, plus 45¢ postage and .13¢ California sales tax, if applicable. Also included in the offer are one "Address" and "ASCII" table with each order. Contact:

Ron Santore  
1957 Huasna Dr.  
San Luis Obispo, CA  
93401

For its part, MITS will process all orders and will provide the interface electronics. The interface which fits inside the Teletype will consist of one PC board and a small number of components. It is very easy to assemble. All interconnections will be made with Molex connectors. These connectors come preassembled on the interface cables.

The MITS TTY interface kit will provide "online" and "local" operation; 20 milliamp current loop interface electronics, and power supply electronics.

There are three options being made available under this agreement. These options are:

- (1) Teletype printer only (all options include TTY kit). This is ideal for customers who have a keyboard and an audio-cassette interface (or a COMTER II). Provides economical hard copy printout.
- (2) KSR-33 Teletype. 20 mA current loop Teletype. Same as ASR-33 Teletype without a paper tape reader and punch. For customers with audio-cassette interface who need an input device and hard copy output.

- (3) ASR-33 Teletype. Same as KSR-33 with paper tape reader/punch.

The Teletype machine will be shipped directly from Teletype Corporation to the customer while the interface will be shipped by MITS to the customer. This interface fits inside the Teletype machine and it should not be confused with the interface board needed inside the Altair 8800. To connect an Altair 8800 to a Teletype, you need an SIO-C interface or a 2SIO interface board. These are not included with the Teletype.

PRICES:	Discount	
	Regular	Customers
88-TYR - - - -	\$669	\$629
(Teletype printer and MITS TTY kit)		
88-TYK - - - -	\$769	\$729
(KSR-33 Teletype and MITS TTY kit)		
88-TYA - - - -	\$1,019	\$969
(ASR-33 Teletype and MITS TTY kit)		

NOTE: MITS discount customers are those who have purchased \$1,200 or more worth of Altair equipment.

\*Teletype is a registered trademark of Teletype, Inc.

### SPECIAL TELETYPE ORDER FORM

☐ ENCLOSED IS CHECK FOR \_\_\_\_\_  
☐ MASTERCHARGE NUMBER \_\_\_\_\_ ☐ OR BANK AMERICARD \_\_\_\_\_  
 INCLUDE \$3 FOR POSTAGE AND HANDLING

☐ 88-TYR TELETYPE PRINTER AND MITS TTY KIT  
☐ 88-TYK KSR-33 TELETYPE AND MITS TTY KIT  
☐ 88-TYA ASR-33 TELETYPE AND MITS TTY KIT

☐ PLEASE NOTE THAT I AM A MITS DISCOUNT CUSTOMER

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE & ZIP \_\_\_\_\_

MITS/2450 ALAMO SE/ALBUQUERQUE, NM 87106

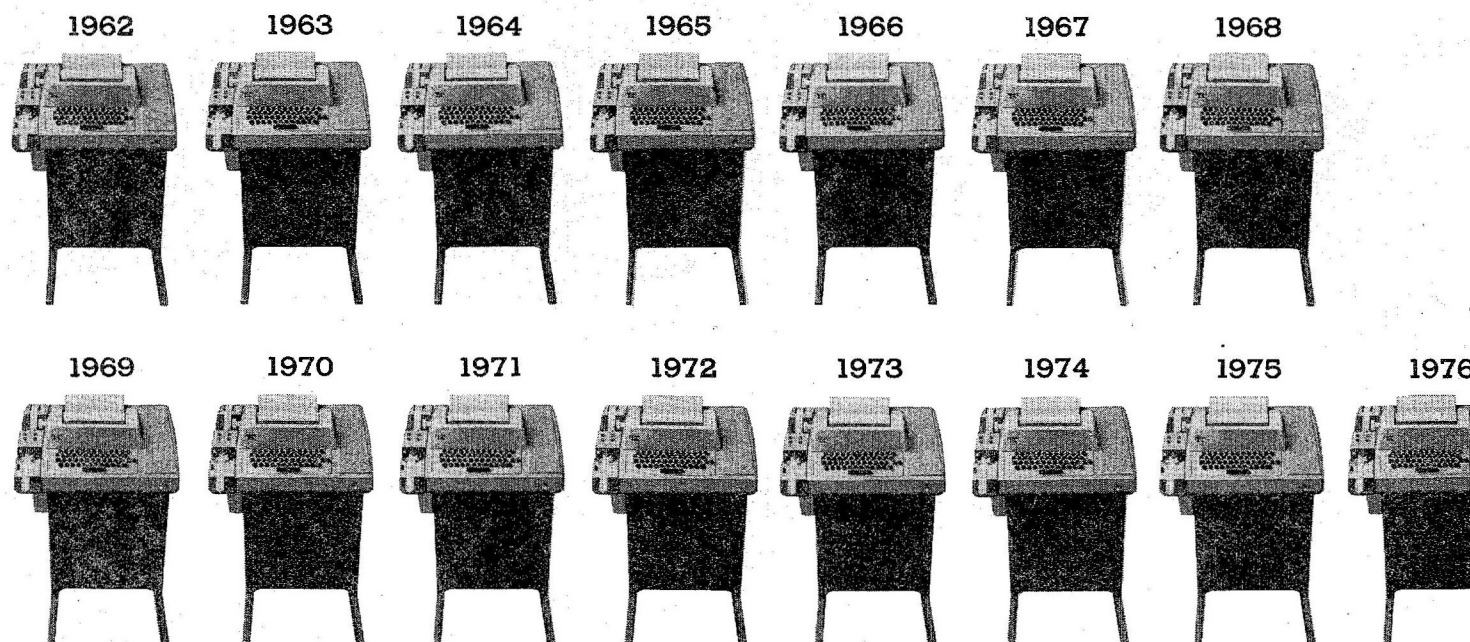
### NEW COMPUTER STORE!

Coming Soon--COMPUTER LAND  
 Delaware Valley's comprehensive computer store. (NJ, PA, DEL. area)  
 Located at: 1228 Barrowdale  
 Rydal, PA 19046 or  
 PO Box 225,  
 Ft. Washington, PA 19034

# ALTAIR CONVENTION

## MARCH 27-28





### **Just how much longer will the model 33 be around?**

The moment economy, reliability and versatility in data communications go out of date, the model 33 will become obsolete. But the more we look at today's business and economic environment, the more it seems the model 33 will live forever.

Because where else can you get so much for so little?

When the model 33 was first introduced, it was a bargain. Today, it's still a bargain. But it's hardly the same machine.

We've got a team of engineers assigned to the model 33 and their job is to keep making it better. Every year, they come up with a number of new features and improvements. Some improvements make the 33 more

dependable and versatile. Others make it easier and more economical to manufacture.

Because of these changes, the model 33s we're building today are standard-duty terminals instead of light-duty units. And our manufacturing changes have enabled us to stay ahead of rising costs.

Since we feel the model 33 is going to be around for a long, long time to come, our parts support, quality service and continued product improvement programs are as strong as ever.

It takes more than manufacturing facilities to build the terminals Teletype® Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.



**The computercations people.**

For more information about any Teletype product, write or call: TERMINAL CENTRAL, Teletype Corporation, Dept. 76U, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-2500. Teletype is a trademark registered in the United States Patent Office.

## Microsystems Selling Altair Equipment in the Nation's Capitol

Altair computer power was brought to the nation's capitol on November 15, 1975 with the opening of MICROSYSTEMS, one of MITS' newest authorized dealers. Located at the edge of the Capitol Beltway in Springfield, Virginia, MICROSYSTEMS is only minutes from the nation's capitol, national monuments, and the Pentagon.

Headed by Russell Banks, the MICROSYSTEMS organization sells, services, and supports the full Altair Computer line. Mr. Banks and the other members of the MICROSYSTEMS team are all seasoned computer professionals with many years of hardware and software experience in business, scientific, and automation applications using mini and micro computers. They are especially qualified and interested in providing turnkey systems using Altair components in a variety of applications.

MICROSYSTEMS operates out of a suite of offices at 6605A Backlick Road in Springfield, serving not only the nation's capitol, but Maryland, Virginia, and the middle Atlantic states. The MICROSYSTEMS offices have been configured into a showroom, office, repair and lab facility, and a meeting/training room. The latter area is the home of the local Washington Area Altair Users Group which invites all local or visiting Altair owners or prospective owners to their regular and informal get-togethers where they exchange hardware, software, and application ideas.

The MICROSYSTEMS grand opening coincided with the MITS seminars in Baltimore and Washington with Mr. Banks being introduced to the attendees by the MITS "Van Man," Mike Hunter. Referring to the capacity crowds and keen interest at the seminars Mr. Banks indicated, "The response has been nothing short of fantastic. We are very happy and proud to be a new part of the Altair team. The large round of applause given at the end of the Washington Seminar by the 126 persons attending was just one of the many fabulous indications of the enthusiasm for the Altair line and the great MITS support. Many of these people came to our grand opening the following day, and many are now Altair owners."

In addition to the Altair line, MICROSYSTEMS is now stocking computer-related publications and parts and accessories of interest to the Altair user. The MICROSYSTEMS organization is geared up to handle both the commercial professional and the hobbyist. If you are interested in an Altair system, adding components to an existing system or hardware and/or software support and engineering services, see them at their Springfield showroom, or call them at (703) 569-1110.

FROM  
PAGE TWO

## USERS GROUP NEWS

form by January 30, please call our office, and one will be mailed to you immediately. Official reservation forms must be returned no later than February 23. Any received after that date will not be assured of room reservations or demonstration space.

Some highlights of the Altair Convention are listed below:

---Program of speakers who are noted in their field. Speakers that are presently scheduled include:

1. Carl Helmers, editor Byte Magazine will speak on the "The Trends and Applications in the Hobby Field".

2. Larry Steckler, technical editor Radio Electronics, topic for speech unknown at present.

3. David Ahl, publisher Creative Computing has tentatively agreed to speak on "Kit Building in Schools & the Role of the Computer in Education".

4. Two members of SCCS will be speaking.

---The new MITS Mobile Seminar program will be presented Friday night, March 26, for early arrivals. The presentation will be conducted by Mr. Pat Ward.

---A second seminar will be presented by MITS on Saturday to cover all Altair products and software. This seminar will be conducted by MITS engineers and software writers.

---Users Group meeting to discuss programs you'd like to see in the Software Library, how we can improve our users group and library, plus additional topics.

---\$10,000 worth of MITS equipment will be given away.

We hope all of you will be able to attend the Altair Convention.

Barbara

# 8080 BASIC

8080 BASIC language software was developed at MITS for use with the Altair 8800 computer and other 8080-based products. Its versatility, efficiency, and ease of use have already put it at the head of the micro BASIC field. If you are building or are planning to build an 8080-based product, you'll want to note the following 8080 BASIC features:

- ✓ String manipulation (substrings, concatenation)
- ✓ String and numeric arrays with up to 30 dimensions
- ✓ Boolean operators (AND, OR, NOT) for IF statements and bit manipulations
- ✓ Four variable types:
  - 16-bit signed integers
  - 32-bit floating point
  - 64-bit floating point
  - rings
- ✓ Assembly language subroutine calls
- ✓ EDIT command
- ✓ PRINT USING for formatted output
- ✓ BASIC may be placed on ROM
- ✓ TRACE on/TRACE off
- ✓ Floppy disk random and sequential data file I/O
- ✓ Direct I/O port access with INP/OUT statements

There are three versions of 8080 BASIC available for use with the Altair 8800 computer from MITS or the Intel 8/MOD 80 or MDS microcomputers or other 8080 systems. BASIC prices for Intel 8/MOD 80 or MDS systems are: Extended BASIC (10.3K bytes) \$350, 8K BASIC (6K bytes) \$200, 4K BASIC (3.3K bytes) \$150. NOTE: Time and materials charges must be added to the above prices to configure BASIC for non-Intel systems.

Licenses for source listings and rights to distribute the binary are also available to oem buyers. Write or call Mr. Paul Allen at the MITS plant in Albuquerque for more detailed information. MITS/2450 Alamo SE/Albuquerque, NM 87106 505/262-1951



# DAZZLER featured in POP 'TRONICS

A new Altair-compatible interface, the TV DAZZLER from Cromemco, is being featured in the February 1976 issue of Popular Electronics. Providing an interface between the computer and a TV set, the DAZZLER can be "used to generate action games, animated displays, educational learning drills, graphs, even light shows--all in full color."\* Considering its versatility and wide variety of applications, the TV DAZZLER represents a unique and affordable concept in computer peripherals.

The basic kit costs \$195 and is designed to plug directly into the Altair 8800 using direct memory access (DMA). There are two PC boards, each taking up one slot on the Altair bus. Board #1 outputs a conventional NTSC (National Television Standards Committee) color video signal, and board #2 communicates with the computer via a high speed DMA controller.

"When writing programs for the DAZZLER, it is important to remember that the TV picture is stored as a specially coded sequence in the computer memory. The DAZZLER simply interprets this code

to form the image."\* Communication between the computer and the DAZZLER uses two output ports (016 and 017) and an input port (016). Output port 016 turns the DAZZLER on and off and sets the starting address of the picture in the computer memory. The data output from port 017 determines the format of the picture as to normal resolution or 4X resolution, amount of memory to be used for the picture, black-and-white or color, and the color or intensity of each frame of the picture. Input port 016 uses one bit to indicate that the DAZZLER is enabled and one bit to indicate the end of a frame.

Interfacing and construction details are outlined in the PE article, along with a parts list, test program, and an octal listing for a DAZZLER Game of Life.

To obtain the schematics, etching and drilling guide and component placement diagram free of charge, send a stamped (for 3 oz.), self-addressed 9" x 12" envelope to:

Cromemco  
One First Street  
Los Altos, CA 94022

Prices for the TV DAZZLER:

\$195-kit  
\$215-kit with IC sockets  
\$350-assembled and tested DAZZLER

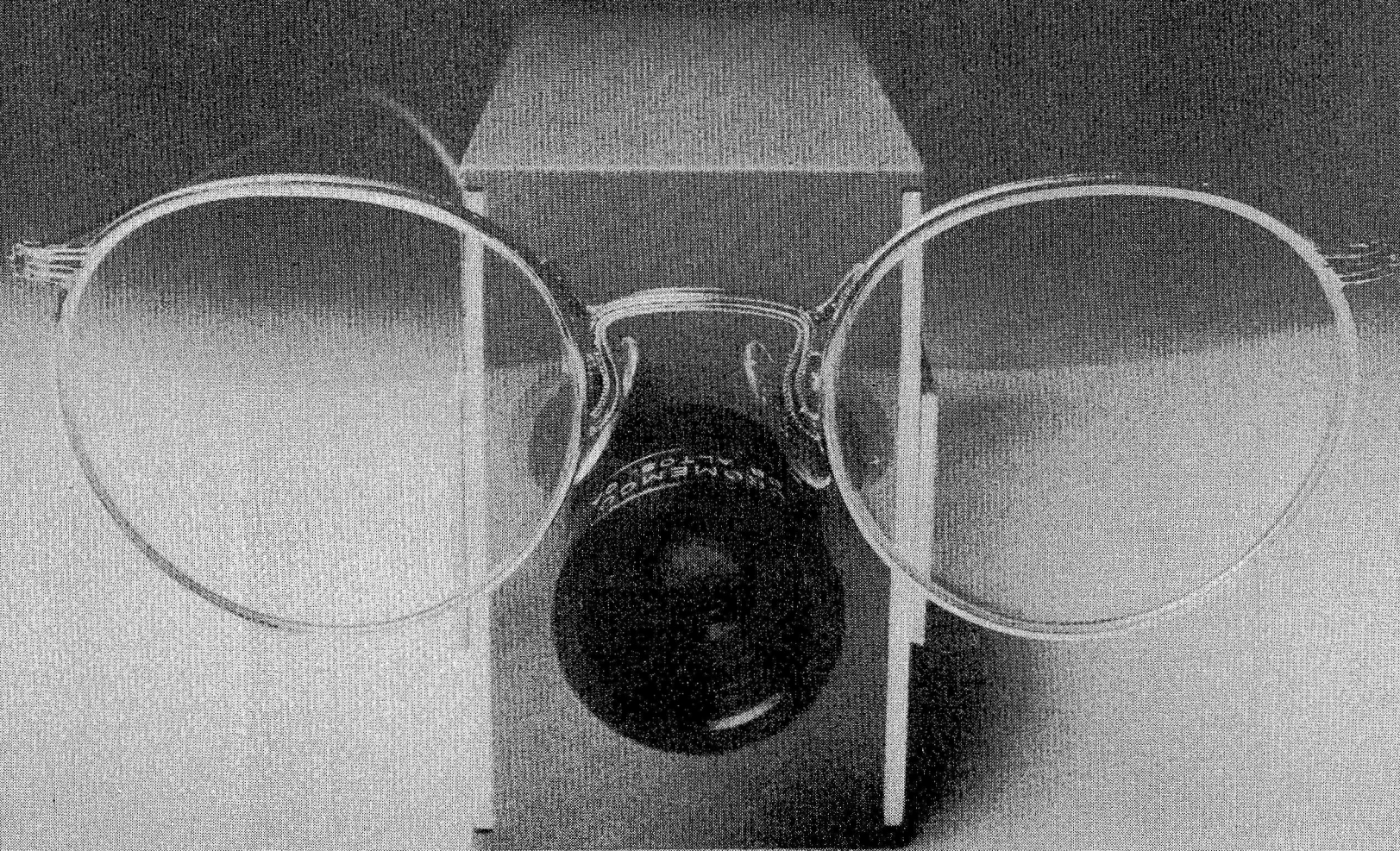
\*"Build the TV DAZZLER" by Terry Walker, Roger Melen, Harry Garland, and Ed Hall. Popular Electronics, Feb., 1976.

**NOTE:** Static memory is required in the Altair 8800 when interfacing with the TV Dazzler.

**THE ONE AND ONLY  
ALTAIR 4K STATIC**

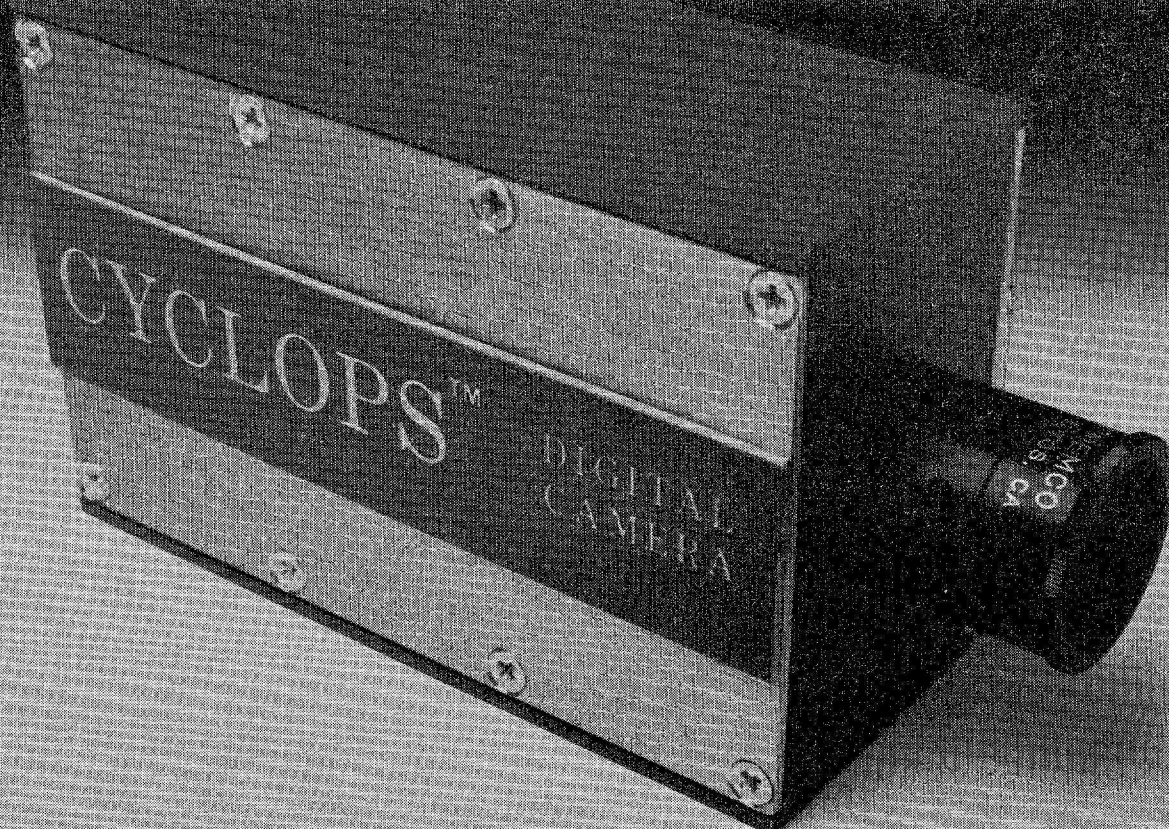
SEE  
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# Eyes for your Altair





# CYCLOPS



## The Cyclops Camera

The Cyclops Camera (88-ACC) is a general purpose digital camera using 1024 element, 32 by 32 image sensor. In particular, the Cyclops is designed to be used with the Cyclops Camera Controller (88-CCC) to interface the camera to the MITS Altair 8800 computer.

The camera is equipped with a 25mm, f-2.8 lens using a standard "D" mount. Digital differential output is provided for interfacing with digital systems.

All connections to the Cyclops Camera are made to a 9-pin connector on the rear of the camera. For proper operation the Cyclops requires a positive and negative power supply (unregulated), a clock signal, and a reset signal. These signals are all available from the Cyclops Camera Controller (88-CCC) interface.

The Cyclops Camera is built in an extruded aluminum case with an attractive blue baked-enamel finish. The camera is very compact measuring just 4½ x 2¾ x 1¼ inches.

## Applications

Applications include security systems, image recognition systems, and automated control systems.

## Price

The Cyclops Camera and the Cyclops Camera Controller come in both assembled and kit form.

Cyclops Camera (88-ACC-K) Kit	\$180
Cyclops Camera (88-ACC-W) Assembled	\$235
Cyclops Camera Controller (88-CCC-K) Kit	\$260
Cyclops Camera Controller (88-CCC-A) Assembled	\$340

Include \$5 postage and handling. California residents add 6% sales tax.

# CROMEMCO

**One First Street/Los Altos, CA 94022**

## The Cyclops Camera Controller

The Cyclops Camera Controller is designed to interface the Cyclops Camera to the MITS Altair 8800 Computer. The controller consists of two boards that plug directly into the Altair computer.

The controller supplies all clock and power supply signals required for Cyclops, and permits software control of exposure, frame rate, and memory allocation for picture storage. Direct Memory Access (DMA) is used to store the picture in the computer memory.

## Cyclops Coupon

<input type="checkbox"/>	Enclosed is a check for \$	_____
<input type="checkbox"/>	BankAmericard #	_____ Exp. Date _____
<input type="checkbox"/>	Master Charge #	_____
<input type="checkbox"/>	Cyclops Camera	<input type="checkbox"/> Kit <input type="checkbox"/> Assembled
<input type="checkbox"/>	Cyclops Camera Controller	<input type="checkbox"/> Kit <input type="checkbox"/> Assembled
<input type="checkbox"/>	Please send complete information package	
NAME _____		
ADDRESS _____		
CITY _____ STATE & ZIP _____		

**Cromemco/One First Street/Los Altos, CA 94022 Phone (415) 941-2967**



# Letters to the Editor

Dear David:

This is to inform you that the various groups in and around Chicago (of small-computer users) have been merged into one organization, CACHE, and our mailing list is well over 150.

Our organization address is:  
CACHE  
PO Box 36  
Vernon Hills, IL 60061

Computer Notes continues to improve. The Nov./Dec. issue is by far the best, with the borrowings from Byte and Creative Computing. I am sure that all concerned would appreciate it if you would publish the journal in 8 1/2 by 11 format, so that it could be inserted into a ring binder.

Keep up the good work.

Sincerely,  
Bill Precht  
Chicago, IL

Dear David,

Since my 13 year old daughter has a flair for writing and poems, she made a homemade bookmark with a picture of an Altair 8800 computer on it. I thought you might enjoy the poem she composed and printed on the marker.

## THE COMPUTER

The computer is said  
To be man's best chum  
I'd say because a computer isn't dumb

It can make true  
All of man's wildest dreams  
And never goof up  
Or so it seems

So when you hear a man say  
That his life is so bare  
It is because he doesn't own  
8800 Altair.

If you have room, I would appreciate your printing this poem in the newsletter. I know she would enjoy seeing it there. Thanks.

William D. Thomas

## Chess Playing Program

Dear Sir:

I recently purchased a Martin Research MIKE-2 Micro Computer and have designed a chess playing program which may be of interest to other Micro Computer users.

To begin with, it requires 4K of memory. I chose to read the program into RAM using a TCH tape cassette interface, input moves via a Clare-Pendar keyboard, and output a picture of the chess board position to a TV screen via a Digital Group 8-line CRT interface. The TV picture appears as shown below:

```
BR BN BB BQ BK BB BN BR
BP BP BP BP BP BP BP BP
51 52 53 54 55 56 57 60
41 42 43 44 45 46 47 50
31 32 33 34 WP 36 37 40
21 22 23 24 25 26 27 30
WP WP WP WP 15 WP WP WP
WR WN WB WQ WK QB WN WR
```

The computer always plays white in this first version, but this will be an option later. In this illustration, the computer has made the first move -- P-K4.

Moves are entered via an ASCII keyboard as follows:

P65,45 would move the Black pawn to square 45.

I have designed two overlays for the program, but only the second overlay actually plays chess, and it may be used as a stand alone program if desired. The first overlay is designed to play "book" openings--the user could tailor his own initial responses to suit himself. When the user makes a move which does not exist in the first overlay "book", the program automatically calls the TCH recorder interface and reads in the second overlay which evaluates the board to see if a checkmate is possible--within a specified search depth. If no mate is possible, as is the normal case, the program chooses a "best" move using a series of adjustable criterion. Needless to say, the best move evaluation is an ongoing investigation and will be constantly updated.

The "book" overlay program is a simple search algorithm, however, the chess playing overlay is complex in design. It cannot be said to play good chess yet. Primarily, it is a fun program which a beginner to average player would find stimulating. The opportunities for improving its performance, however, are manifold, and I believe it will eventually prove to be a challenging competitor.

The program has the following limitations in its first version:

1. It does not recognize illegal user moves, nor can it recover from mistaken keyboard entries.
2. It cannot "castle" or take a pawn "in-passing". It will not object to the user making these moves, however.
3. The computer plays white--for now.

These limitations are not a serious compromise and should be easily improveable.

It should be added that the algorithm which is used in this 8008 application is equally amenable to the 8080 or 6800 CPU users.

Finally, I would like to say that I have spent a great deal of time and effort in the design and implementation of this program--spanning over five years. I would like to think that it may have some commercial value. To that end, I am contacting several potentially interested parties and would be very curious as to your comments.

Sincerely,

John Ford  
5561 Esplanada Ave.  
Santa Maria, CA 93454

Dear David:

KOMPUUTER PHREQUEHAUTE!  
@3#\*?&! On page 9: That nice little routine under interrupt in your serial I/O article October issue of COMPUTER NOTES has one little bug in it, no one seemed to notice. (Just thought I'd make note on it before someone tries to run it as is). Line 11 should read:

```
2 11 010 Jump to self and
      wait for interrupt.
```

As is, the machine DAD's on jump back!

I'd also be interested in hearing from some of the computer Phreques in this area (very up-state New York) so you can put my name on your pencil pal list.

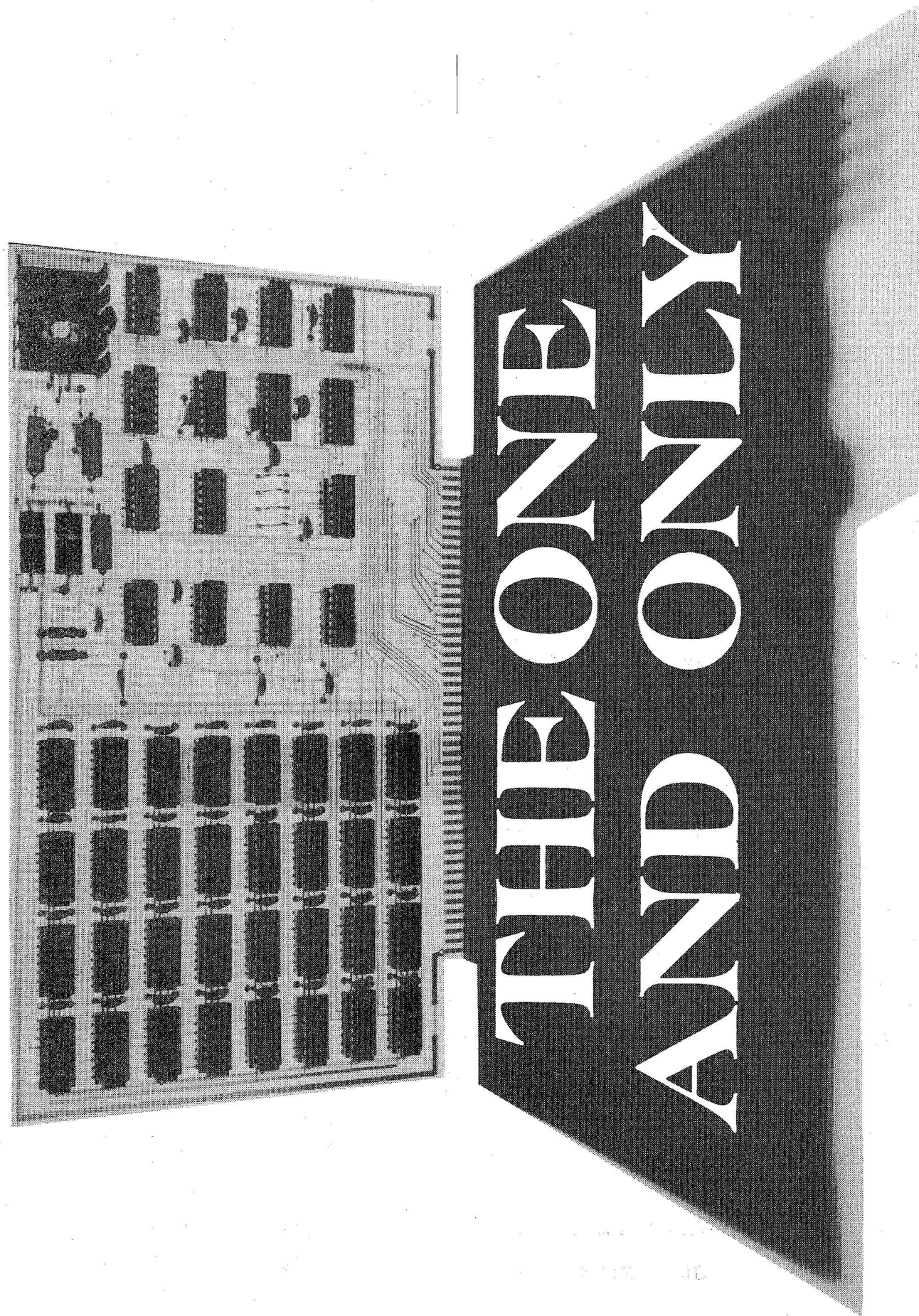
Cordially,

Harris G. Bruch  
Plattsburgh, NY

Dear David,

Thank you for your very lucid and persuading answer to my letter about changes to the Altair. I was a little surprised to see it in Computer Notes, but I suppose many people would be wondering about modifications and it is reassuring to know that we owners can get the real scoop. Let me take this opportunity to tell you that Computer Notes started off at a good level and has been improving every issue. I really look forward to receiving it. Please thank Tom Durston, a telephone friend of mine, for the excellent article on the "I/O Programs for the ACR".

Sincerely, Dr. George L. Haller  
Naples, Florida



**ALTANIR 4K STATIC**



# THE ONE AND ONLY ALTAIR 4K STATIC

ALTAIR 4K STATIC FROM MITS IS UNQUESTIONABLY THE FINEST 4K STATIC MEMORY AVAILABLE ANYWHERE. IT IS ALSO THE FASTEST.

ALTAIR 4K STATIC USES INTEL 2102 A-4 MEMORY CHIPS WHICH HAVE A WORST CASE ACCESS OF 450 NANOSECONDS AT 70 C. AT NORMAL SYSTEM TEMPERATURES THE ACCESS TIMES ARE TYPICALLY LESS THAN 300 NANOSECONDS.

ALTAIR 4K STATIC IS FULLY ISOLATED FROM THE SYSTEM BUS BY SCHMITT<sup>TM</sup> TRIGGERS. THUS, THE EXCESSIVE CAPACITIVE LOADING CAUSED BY OTHER 4K STATIC MEMORIES IS ELIMINATED. USE OF THESE TRIGGERS ON ALL ALTAIR 4K STATIC INPUTS GREATLY REDUCES NOISE. INTERNAL DATA COLLECTION NODES ALSO USE SCHMITT TRIGGERS, WHICH PREVENTS INTERNAL DATA BUS NOISE FROM BEING TRANSMITTED TO THE SYSTEM DATA BUS.

ALTAIR 4K STATIC USES THE NEW 8800B SCHOTTKY NOISE SUPPRESSION SCHEMES. ALL LOGIC USED IN THE CARD IS LOW POWER SHOTTKY, WHICH RESULTS IN THE SPEED OF STANDARD TTL AND USES ONE FOURTH THE POWER.

ALTAIR 4K STATIC IS THE ONLY 4K STATIC SUPPORTED BY MITS. OWNERS OF ALTAIR 4K STATIC ARE ELIGIBLE TO QUALIFY FOR DISCOUNTS ON ALTAIR BASIC AND OTHER MITS PRODUCTS.

ALTAIR 4K STATIC IS THE ONLY 4K STATIC THAT COMES WITH ALL THE REQUIRED ALTAIR HARDWARE INCLUDING EDGE CONNECTORS AND CARD GUIDES.

ALTAIR 4K STATIC IS THE ANSWER FOR ALTAIR OWNERS WHO NEED STATIC MEMORY FOR SPECIAL APPLICATIONS SUCH AS THE TV DAZZLER FROM CROMEMCO.

## PRICES:

ALTAIR 4K STATIC KIT.....\$159  
ALTAIR 4K STATIC KIT WITH 2K MEMORY...\$134  
CHIP SET TO CONVERT 2K TO 4K.....\$45

NOTE: BEFORE YOU ARE MISLED BY "LOWER" PRICES ON OTHER 4K STATIC MEMORIES, ASK YOURSELF THESE THREE QUESTIONS: 1. IS THIS CARD ENGINEERED AS WELL AS MITS 4K STATIC? 2. DOES IT COME COMPLETE WITH EDGE CONNECTORS AND CARD GUIDES? AND 3. DOES IT QUALIFY ME FOR MITS ALTAIR DISCOUNTS?

AS WITH OTHER 4K STATIC MEMORIES, ALTAIR 4K STATIC WITH A 5 VOLT CURRENT EXCEEDS THE SYSTEM BUS SPECIFICATIONS. WHILE POWER CONSUMPTION IS LESS THAN MANY 4K STATICS, IT STILL DRAWS APPROXIMATELY 1 AMP.

ALTAIR IS A REGISTERED TRADEMARK OF MITS, INC.

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☐ ALTAIR 4K STATIC KIT ☐ ALTAIR 2K STATIC KIT  
 INCLUDE \$3 FOR POSTAGE AND HANDLING

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE AND ZIP \_\_\_\_\_

MITS/2450 ALAMO SE/ALBUQUERQUE, NM 87106

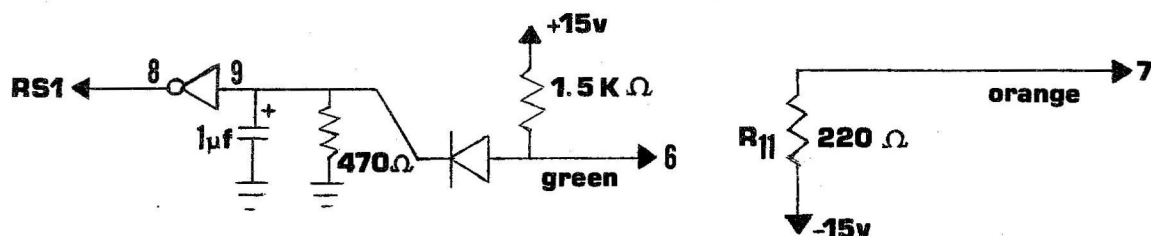
# SIOC REV 0 MOD

In house, the SIOC Rev 0 boards underwent two significant changes. One change, the more apparent of the two, concerns the location of the interface connections between the TTY and the board as well as the nature of the interface electronically. First the position of the pins between the computer and the TTY will be redefined to be more compatible to the Rev 1 cabling. The color code is arbitrary but provided in order that the client is aware of MITS standards.

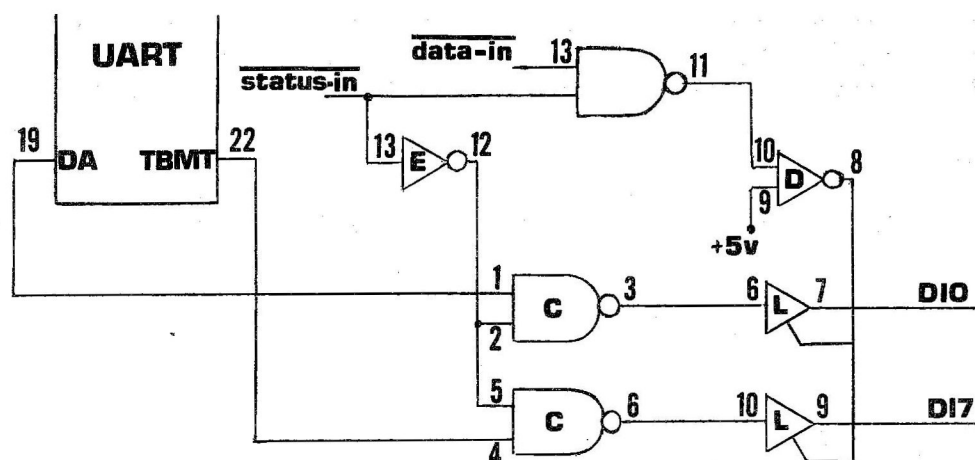
<u>Molex Conn on Board</u>	<u>Color</u>	<u>Male &amp; Female 25-Pin Conn.</u>	<u>Term Lugs in TTY(ASR-33)</u>
4 (Gnd)	Black	2	6
5 (Tran)	Red	3	7
6 (Rcv)	Green	4	3
7 (Rcv)	Orange	5	4

It might also be noted that the SIOC board is capable of only functioning with full duplex transmission. That is, a White-Blue lead and a Brown-Yellow lead should be moved from term lugs 4 and 3 respectively to lug 5. Unless some major change has been made in the interface electronics the SIOC board will have difficulty in functioning with a 60mA current loop in the TTY. The desired 20MA loop can be obtained by 1) moving a Purple lead from lug 8 to lug 9. 2) Moving the left-most terminal on R1 (a 4 connection resistor located about 8" back from the line/local switch on the base plate) to the left-most terminal connection of R1 (from the 3rd connection to the 4th connection).

The Rev 0 modified electronic interface and the Rev 1 interface appear below:



The second modification of the Rev 0 board (called hardware interrupt) is in the status provided to the data bus by the UART. The new board will pull DIO low on the DA high condition (input status) and will pull DI7 low on favorable output status. The logic follows.



## Cassette Test Pattern

Effective 1 Feb. 1976, all cassette tapes shipped from MITS will have an additional test pattern recorded on the back side. After the 125 test pattern (90 sec.), there will be 1 minute of a 175 test pattern. This is to check the demodulator on a non-symmetrical signal. Use the 333,007, single step twice procedure to examine the data coming from the A. C. R. to check for the correct pattern on the 175's.

## Recording/Playback Method Changed

Effective 1 Feb. 1976, all cassette tapes shipped from MITS will be recorded on the left channel only. This will improve performance on playback on monaural and stereo cassette machines. If you use a stereo recorder connect only to the left channel for recording and playback.

# **MITS MOBILE Computer Caravan**

The MITS Mobile Caravan will be on tour again in the near future. As most of you are aware, we are in the process of moving to a new facility. This, in conjunction with the Altair Convention (WACC) in March has caused some delays in the tour.

The Texas trip which tentatively includes Lubbock, Dallas/Ft. Worth, Houston, Corpus Christi, San Antonio, Austin, Odessa and El Paso, will probably begin in late March or early April. The West Coast trip will follow sometime during May.

We are currently working on changes in the seminar format. These modifications will include additional information in the course manual, more equipment demonstrations, and more thorough coverage of hardware and software.

Submitted by Pat Ward  
1/6/76

## GOOFS!

On page 24 (back page) of Nov./Dec. 1975 Computer Notes, there is a diagram for tape recorder motor control. The pins for the IC "U" are incorrect as shown.

Input-Pin 12 of IC "U" should be Pin 4.

Output-Pin 11 of IC "U" should be Pin 5.

Pin 9 of Molex connector should be Pin 6.



# Two Monitors Top Software Contest

by Bill Gates

Twenty programs were added to the library this month, ranging in size from 9 bytes to more than 1800. For those users who are learning about machine language programming, the short programs in the library can be useful as learning aids to illustrate basic concepts. User groups might consider ordering most of the programs in the library to put in a notebook to make available to members. If enough groups are interested in this, we'll have a special "package deal" price. The long programs, of course, are the most useful and are sometimes written by people with lots of experience. The main problem with these is loading them onto paper tape or cassette takes a long time. I encourage users to share machine readable copies of these programs. This will be simplified if everyone stores programs in either a straight dump format; or in the MITS checksum format (using the checksum dumper in the library).

Another source of 8800 programs is the Intel 8080 library. Paying to join is expensive, but contribution of a substantial program entitles you to a free membership. They have all the floating point subroutines, numerous cross-assemblers, and some neat games (Blackjack, Life, Kalah). MITS has no objections to users submitting programs to both libraries.

Both the first and second place major programs this month are monitors--a utility program to help run, load, save and set up other programs. For users with 8K or more, Package 1 is the best thing to use, but for users with less memory, a smaller monitor with features to examine or modify core locations and save or load programs is very handy. Both monitors are small enough to be put on ROMs.

The programs that tied for third place, both by Lee Eastburn who gets a double prize (\$30), not half for each, are both good demonstration programs. I think those users who think such programs are complex to write will be surprised to see how easily they understand the logic in these two programs. That's not to say they took very little time to write. The data for BLAZER fills over a 100 of our coding sheets, all of which had to be finished, experimented with, and typed up.

I hope everyone sends in the programs they wrote over the holidays so next month will be another record month for the library.

## FIRST PLACE MAJOR PROGRAM

#1203751

Author: Jim Gerow

Length: 867 bytes

Title: 8800 Mini-Monitor

A complete monitor that provides several commands:

- Examine - prints contents of a single location
- Deposit - store into a location
- Program - give a start address and program data
- Run - start execution at a given address
- Tape - I, O, or V -- allows programs to be dumped to, input from, or verified on cassette.
- Search - scans memory for a specific value.
- Clear - zero locations between two addresses
- List - display memory contents between two locations.

## SECOND PLACE MAJOR PROGRAM

#1217552

Author: Walter King

Length: 384 bytes

Title: Micro-operating System

An extremely handy operating system that allows saving and loading from cassette, dumping of memory locations, running of programs; and provides subroutines for character input, character output, string output, cassette input, and cassette output. Functions such as program loading can be done with program calls.

- CONTINUED PAGE 14 -

# MAINTENANCE SOFTWARE

By Harvey Lee

Maintenance software serves two primary purposes. First, it aids in identifying problem areas that exist within a computer system. Second, by not finding any problems, it should give a high degree of confidence in the system. With these thoughts in mind, we use several different programs in the process of checking out repair and production computers.

Let us consider how one short program can be of use in this regard.

Sense Switch Read				
TAG	MNEMONIC	ADDRESS	OCTAL CODE	EXPLANATION
STRT	IN S.SW	000,000	333	Input sense switch data (I/O channel 377)
		001	377	to the accumulator
	STA 100	002	062	Stores the contents of the accumulator
		003	100	in memory location 100 (octal)
		004	000	
	JMP STRT	005	303	jump to the start of the program
		006	000	
		007	000	

This program reads the sense switches (A8 through A15), then stores the information in memory location 100. Thus, when memory location 100 is displayed, the data lights should reflect the positions of the sense switches. For example, if switch A8 were up, then D0 would be on. Or if A15 was down, then D7 would be off.

What this program tells the technician depends on his knowledge of the computer. If the technician has trouble entering or checking the program in the computer's memory, he knows the proper portions of the D/C board, CPU board, and memory boards to check for the problem.

After loading the program, he should then single step through the program. By observing as it executes the program step by step, he can often identify a problem area on the CPU board or on the D/C board. -CONT P.17-

# SOFTWARE

# SOFTWARE NOTES

## Multi-Precision Arithmetic

By Bill Gates

On the 8080, multi-precision unsigned arithmetic is made easy by the carry bit and its affect on the instructions "ADC" and "SBB". Unsigned arithmetic treats all numbers as positive, with all zeros being the least number, and all ones being the highest. Adding and subtracting memory addresses is the most common form of unsigned arithmetic. Multi-precision arithmetic must be used whenever the range of values desired is greater than that accepted by the arithmetic unit of the computer you are using. The 8080's arithmetic units accept 2-8 bit operands, one from the [A] register and the other from B, C, D, E, H, L, contents of address in [H, L] or the byte following the arithmetic instruction (immediatemode) so anytime values greater than 255 are to be accepted, multi-precision arithmetic must be used. "DCX", "INX" and "DAD" allow 16-bit quantities to be added to, or subtracted from, so 16-bit arithmetic could be considered single precision. However, the lack of any 16-bit arithmetic instructions that use carry to affect their result make it more appropriate to consider 16-bit arithmetic multi-precision.

```
;16-bit unsigned add [H, L] = [D, E] + [H, L]
ADD16U: DAD D
;carry is set as an overflow indicator
```

```
;32-bit unsigned add [D, E, B, C] (M + 3, M + 2, M + 1, M)
```

```
ADD32U: MOV A, C
        ADD M
        MOV C, A
        INX H
        MOV A, B
        ADC M
        MOV B, A
        INX H
        MOV A, E
        ADC M
        MOV E, A
        INX H
        MOV A, D
        ADC M
        MOV D, A
        RET
;carry is returned as an overflow
;indicator
```

```
;16-bit subtract [H, L] = [D, E] - [H, L]
```

```
SUB16U: MOV A, E
        SUB L
        MOV L, A
        MOV A, D
        SBC H
        MOV H, A
        RET
```

```
;carry indicates that [H, L] was greater than [D, E]
```

```
;32-bit subtract [D, E, B, C] = (M + 3, M + 2, M + 1, M) - [D, E, B, C]
```

```
SUB32U: MOV A, M
        SUB C
        MOV C, A
        INX H
        MOV A, M
        SBC B
        MOV B, A
        INX H
        MOV A, M
        SBC E
        MOV E, A
        INX H
        MOV A, M
        SBC D
        MOV D, A
        RET
```

```
;carry indicates [D, E, B, C] was greater than (M + 3, M + 2, M + 1, M)
;add 8-bit [A] to 16-bit [B, C] unsigned. Result in [B, C]
```

```
AD816U: ADD C
        MOV C, A
        ADC B
        SUB C
        MOV B, A
;no overflow indication is given
```

## SOFTWARE CONTEST

### THIRD PLACE MAJOR TIE

#1201751

Author: Lee Eastburn  
Length: 309 program bytes,  
1536 data bytes

Title: BLAZER

Prints 4 block letters using 64 characters across and 12 lines vertically. All printing characters are provided for, and "custom" characters can easily be added. Allows for characters to be printed and background blank, or character to be blank and background printed. The characters used in making the blocks are part of the input to the program.

### FIRST PLACE SUBROUTINE

#1124753

Author: George Rompot  
Length: 44 bytes  
Title: DIV 16

Divides two 16-bit unsigned integer values. Returns a 16-bit quotient and a 16-bit remainder. Uses subroutine #1124752.

### SECOND PLACE SUBROUTINE

#1201752

Author: Jeffrey Clark  
Length: 59 bytes  
Title: Display Clock

A clock subroutine which displays either the second, minute, hour, or day in the address lights, depending on the sense switches. The initial time can be entered in locations 100-103.

#1124751

Author: George Rompot  
Length: 7 & 9 bytes  
Title: RDEL & RHLDEL

A 16-bit left shift routine for [D, E] and a 32-bit left shift routine for [H, L, D, E].

### THIRD PLACE MAJOR TIE

#1217751

Author: Lee Eastburn  
Length: 335 bytes  
Title: Calendar Printer

Prints a calendar for any month. When the box for each day is typed, the user can type a single character to select one of the preset messages or a special message can be typed in. The format is 71 characters across (10 per day) and 64 lines vertically. The heading includes month name, and day name for each column.

#1124752

Author: George Rompot  
Length: 26 bytes.  
Title: MPY8

A subroutine to multiply [C] by [D, E], leaving the result in [H, L]. Overflow is handled by a special return sequence. The 2-byte left shift routine in #1124751 is called.

-CONTINUED P. 15-

-CONTINUED P. 15-



Signed Arithmetic

In signed arithmetic (2's complement) half the numbers are treated as negative and the other half as positive. A 1 followed by all zeros is the smallest number. All 1's is the largest negative number (-1), and all 0's is the smallest positive number. A zero followed by all ones is the largest number. Note that the absolute value of the smallest number (a one followed by all zeros) is larger than the largest number. This creates an overflow case for negation, and makes subtraction tricky if this special case is handled. This "special" negative number is -32768 if 16-bit signed arithmetic is used. This highest 16-bit signed number is 32767.

This signed format allows two numbers to be added through a simple DAD. The only complication is checking for overflow. The table below gives the different possibilities for adding signed numbers:

	Arg 1	Arg 2	Carry	Sign of Result	Overflow
1	pos	pos	off	neg	yes
2	pos	pos	off	pos	no
3	pos	neg	off	neg	no
4	pos	neg	on	pos	no
5	neg	neg	on	neg	no
6	neg	neg	on	pos	yes

Overflow only occurs when the result of adding two positive numbers is greater than 32767, or the result of adding 2 negative numbers is less than -32768. The formula: ( $\otimes$  means exclusive - or)

Sign of arg 1  $\otimes$  sign of arg 2  $\otimes$  carry  $\otimes$  sign of result is 1, if and only if overflow occurred. Subtraction is merely a negation followed by an addition, unless -32768 is being subtracted (i.e. -30 - (-32768)), in which case no negation is necessary, but the sign of -32768 as an addend must be positive.

;16-bit signed negate [H, L] = -[H, L]

```

NEGIGS: XRA A                ;get negative [L]
        SUB L
        MOV L, A
        SBB H
        SUB L
        MOV H, A            ;[H] = -[H] - borrow if any
        SUI 128             ;see if -32768 (decimal)
        ORA L               ;with [H] = 128, [L] = 0
        RNZ                 ;if not, return
        JMP OVERFL          ;overflow here

```

;16-bit signed add and subtract [H, L] = [D, E] = [H, L]

```

SUBENT: CALL NEGIGS          ;entry from subtraction
ADD16S: MOV B, H             ;MSB of [B] = sign of arg 1
SBZENT: DAD D                ;do the add
        RAR                 ;MSB of [A] = carry
        XRA B               ;XOR in sign of arg 1
        XRA D               ;XOR in sign of arg 2
        XRA H               ;XOR in sign of result
        RP                  ;return if MSB 0
        JMP OVERFL          ;otherwise there was overflow

```

;subtract [H, L] from [D, E]

```

SUB16S: MOV A, H             ;is it -32768?
        SUI 128
        ORA L
        JNZ SUBENT          ;if not, just negate and add
        MOV B, L            ;say sign is positive
        JMP SBZENT          ;do the add

```

USR Routines

There are two ways for a "USR" routine to get the argument passed to it as a signed integer in [D, E]. The easiest is to use a CALL followed by the two byte address in locations 4 and 5. The only disadvantage to this is that it has to be changed when you get a new version of BASIC, since the address in locations 4 and 5 changes from version to version. The alternate way is long, but doesn't have to be changed when you get a new version of BASIC. It is:

```

LXI H, BACK LC
PUSH H
LHLD 4
PCHL
BACKLC: rest of USR routine

```

-CONTINUED P.17-

SOFTWARE CONTEST

#1125751

Author: Christopher Terry

Length: 23 lines

Title: INDEL

Basic subroutine "INDEL" which inserts a fixed length digit string in, or deletes it from a string which can contain multiple digit strings. Several examples are given.

#1125752

Author: Mathew Smith

Length: 56 bytes

Title: Random 16

Generates a 16-bit random number. All possible numbers are generated before any number repeats.

#1125753

Author: Craig Pearce

Length: 43 bytes

Title: Number Guessing Routine

A well-documented routine that uses the front panel to play a high/low number guessing game with the user. (Good illustration of basic techniques.)

#1125759

Author: J. Scott Williams

Length: 50 lines

Title: Basic Cassette Dumper

A very handy program that allows data on cassette to be printed out in ascii, octal, hex, or decimal. Full instructions and examples are given.

#1201753

Author: Jeffrey Clark

Length: 9-136 bytes

Title: RELJMP

Uses an RST subroutine to allow 2-byte jumps to locations within 128 bytes of the jump. Similar to M6800's "BRA", and can be used to make long programs shorter.

#1201754

Author: Jack Coats

Length: 12 bytes

Title: Vectored Branch

A subroutine that branches back to a location 2 \* [A] beyond the call.

#1201755

Author: Gary Rupert

Length: 21 bytes

Title: Set Memory Demo

Stores the low 8-bits of each address in that address up to a specified limit.

#1208751

Author: George Burditt

Length: 16 bytes

Title: Vectored RST

Allows up to 256 3-byte RST instructions by using a normal RST followed by an argument. Non-interruptable and impractical, since a CALL to each routine would be simpler, but very illustrative of stack techniques.

-CONTINUED P.16-

Here are 4 example USR routines written for 4K and 8K BASIC. In Extended BASIC, the argument is passed and returned in [H, L]. So appropriate modifications will have to be made to use these with Extended BASIC.

#1 function: turn interrupts ON if argument is negative.  
turn interrupts OFF if argument is positive.

```
CALL <address at location 4>
MOV A, D           ;get argument high order
ORA A             ;set MINUS if negative
DI                ;assume positive
RP                ;return if so
EI                ;otherwise, turn interrupts on
RET
```

#2 function: Delay for 11.5u seconds \* argument + overhead

```
LOOPDL: CALL <address at location 4>
DCX D             ;decrement the argument
MOV A, E          ;is [D, E] = 0?
ORA D
JNZ LOOPDL        ;if not, continue looping
RET
```

#3 function: Execute instruction or instructions in [D, E]. Return value of [A].

```
CALL address at location 4 ; get argument in [D, E].
XCHG
SHLD INSTRS
LXI, H 0           ;save the stack pointer
DAD SP
SHLD STORSP + 1
LXI SP, PSWLOC + 1 ;set up to read the USR ac-
POP PSW            ;cumulators, fetch the USR
POP H              ;accumulators
POP D
POP B
INSTRS: DS 2
PUSH B             ;store the USR accumulators
PUSH D
PUSH H
PUSH PSW
MOV B, A           ;return the contents of [A].
XRA A              ;as the result in [A, B]
STORSP: LXI SP, 0   ;restore the stack pointer
LHLD 6             ;convert [A,B] and re-enter
PCHL               ;the BASIC program
PSWLOC: DS 8        ;the accumulators can be set
                   ;up and examined by using
                   ;PEEK's and POKE's on these
                   ;locations
```

#4 function: dispatch to one of several subroutines depending on the high 8-bits of the argument

```
CALL <address at location 4>
LXI H, TBLLOC      ;point at dispatch table
MVI B, 0           ;get dispatch offset
MOV C, D           ;in [B, C]
DAD B              ;add in 2 * offset since
DAD B              ;table entries are 2 bytes
MOV A, M           ;fetch the dispatch address
INX H              ;into [H, L]
MOV H, M
MOV L, A
PCHL               ;dispatch
TBLLOC: DW USRZER   ;address to go to on zero
DW USRONE          ;on one
DW USRTWO
```

#### Note on allowing interrupts

To allow interrupts a program must always leave 16-bytes of free stack space. If multiple interrupts can come in 16 \*(maximum number at once) bytes must be left free. Also no tricks involving INX SP or DCX SP can be used. The third example USR routine is not interruptible, since an interrupt following the LXI SP would not work.

Next Month: signed and unsigned multiplication and division.

#1209751

Author: Alan Miller  
Length: 20 bytes  
Title: Count in Lights  
Using a modifiable delay period, this program counts in the upper eight address lights.

#1216751

Author: Sasan Ardalan  
Length: 15 bytes  
Title: 8-bit BCD to Binary  
A non-looping BCD to binary routine. Execution takes 42 microseconds and all registers are saved.

#1223751

Author: Frederick Dingwall  
Length: 48 bytes  
Title: 8-bit Octal Input  
Inputs 3 ascii characters which are converted to an 8-bit number which is stored in memory. Allows contents of consecutive locations to be stored in order of input.

#1223752

Author: Frederick Dingwall  
Length: 48 bytes  
Title: 8-bit Hexadecimal Input  
Same as #1223751, except numbers are input as 2-character hexadecimal constants.

see  
you  
at  
the  
WACC!

MARCH 27-28



by Paul Wasmund

# PACKAGE I REVISITED

After loading the MONITOR as described in Appendix E of the Package I manual, use the following example to load the editor.

## Example 1.

To load the editor from a TTY:

1. Type the following monitor commands.

```
?OPN MAG, TY, A
```

```
?EDT, MAG
```

2. Put the paper tape in the reader and turn the reader on.

To load from an ACR:

1. If you stopped the cassette within 5 seconds after the monitor loaded, skip the next step.

2. Rewind the cassette. Turn the recorder to play and wait 3 minutes and 45 seconds. Stop the recorder.

3. Type the following monitor commands.

```
?OPN MAG, AC, A
```

```
?EDT, MAG
```

4. Turn the recorder to play. When the editor has finished loading, it will type:

```
START INPUT
```

```
*
```

Once the editor is loaded, you are ready to type in a program. Remember, the first statement of your program should be a ORG and the second should be a ORR if needed.

Let's now review the use of the ORG and ORR pseudo op's. The ORG pseudo op is used to define the locations that the program will run in, while the ORR instruction sets the location to save the program in while assembling.

## Example 2.

You have written a program that is approximately 1K long. You want to assemble it to run in the lowest memory available in your machine, which is 3700Q when using the REV 2 monitor. You want to assemble it by using the version 1 (ASM) assembler. The first statement should be:

```
ORG 3700Q; Sets Run Loc
```

```
ORR 14000Q
```

The ORR statement was used because ASM ends at 11635Q, so your program could not be stored at 3700Q. 14000Q was chosen to leave space for a symbol table.

Once you have typed in the ORG and possibly an ORR statement, you can type in the main body of your program. Do not include an END statement in your program. After the entire program has been entered, and any typing errors corrected, you are ready to dump off a copy of the program. To do this, return to the monitor, open MAG to your mass storage device (AC or TY), and give the ASCII option. Then return to the editor with the R option (i.e. EDT (R)), and dump the program using the Save (S) command.

## Example 3.

```
*E
```

```
?OPN MAG, TY, A
```

```
?EDT(R)
```

```
*S
```

```
FILENAME=
```

```
CHANGE SENSE SWITCH 15 FOR DUMP
```

When this message is printed, turn on your punch and flip sense switch 15. If you have a ACR, change the open command as follows.

```
?OPN MAG, AC, A
```

and, after FILENAME=, type a 3 character file name followed by the carriage return.

NOTE: MAKE SURE THE CASSETTE IS BLANK OR YOU ARE POSITIONED AFTER THE LAST FILE ON IT.

Now, load the assembler by substituting ASM for EDT in Example 1. When the assembler has finished loading, the following message is printed.

```
ALTAIR LOADING ASSEMBLER VERSION
```

```
2.2
```

```
*ASM*
```

If you saved your program on the ACR, make sure the last time you opened MAG, you used the following command:

```
?OPN MAG, AC, A
```

If that's not true, return to the monitor, give the above command, and restart the assembler.

```
?ASM
```

If you have a paper tape of your program, load it into the paper tape reader and start it running. If you have a cassette of your program, type the following:

```
FILE NAM ;INSTEAD OF NAM PUT
;THE 3 CHAR NAME YOU
;GAVE THE FILE IN THE
;EDITOR (FILENAME =
;FILENAME).
```

The assembler should return to the monitor when finished with your program. At this point, you should set up to make an absolute dump as follows:

```
?OPN MAG, TY (Substitute AC for
TY if you are
dumping to a cas-
sette.)
```

```
?ASM(P, A) (If you want the
symbol table dumped
and/or an inverse
assembly, include
the options now.)
```

```
*ASM*
```

```
END NAM ;REPLACE NAM WITH THE 3
;CHARACTER NAME YOU WANT
;TO CALL THE PROGRAM.
```

```
SENSE SWITCH 15 FOR DUMP
```

At this point, turn on the tape punch or recorder, and flip sense switch 15. When your program has finished dumping, a message will be printed indicating this. You can now return to the monitor to test your program.

## — MAINTENANCE SOFTWARE —

The last thing he does is to run the program, stopping to examine the memory for each of the sense switches. This assures proper sense switch reading, which is necessary when loading BASIC.

If the program fails to execute properly, the technician then begins his troubleshooting in the appropriate area.

If the program will run and single step, but yields the wrong data at memory location 100, he has several possible problem areas. First a visual inspection is made on the CPU board to verify R9 through R16 are 4.3K ohm resistors and 1C"Q" is a TI 74123. Next the timing relationship of Ø1 and Ø2 are checked. If this checks properly, he will then check the logic on the D/C board, starting at 1C"U" pin 8 (a logic low level that has a high going pulse when the sense switches are being read).

If the computer will operate correctly when either running or single stepping, but not both, the technician should begin his troubleshooting on the CPU board at 1C"R" pin 8 (normally high; goes low to enable DI data bus) and checks logic levels of 1C"O". If the CPU checks out, he will then proceed to the appropriate area on the D/C board to continue his troubleshooting. If improper operation results in writing alternating bit patterns through memory (usually 071 with 000) he begins his troubleshooting with 1C"O" on the CPU. These problems are generally caused by improper enabling of the DI data bus.

As can be seen, this program while short can be of great benefit to the technician. It aids him in identifying the area in which to start his troubleshooting. If he fails to find a problem, he feels confident in the proper operation of the majority of the computers circuits. He is now ready to use more complex programs in checking out the computer. We plan to discuss more of the programs used by us to check out the ALTAIR 8800 in the future. If you have any specific needs, please let us know.

## What's Going On In Here

Which Depts. to call for  
answers to questions.

In our new building we will have a switchboard operator to help us with the growing number of calls we are getting. Therefore, we hope to be giving you better service; however, please be sure that you ask for the specific department you need for answers to your questions. Our departments stay open from 8:00 to 5:00 Mountain Standard Time. However, the Service Department does close down at 4:30 MST.

Ask for the Marketing Department for answers to your price and delivery and "where is my order" questions. The Service Department will take care of your technical problems as you're building or running your machine. The Marketing Department can take care of general technical questions. For example, if you want to know which I/O you need to run the Southwest Technical Products Terminal; ask the Marketing Department--you don't have to bother the Service Department. The Software Department should be called with specifics regarding problems with your tape or questions as to commands, but consult Marketing as to where your order for software is. Accounting rarely needs to be consulted, but if you asked for a refund quite some time ago, you might call them for information as to whether the check has been sent or not. With these few hints and the help of the operator, we hope that your long distance calls will be handled as expeditiously as possible. Thank you very much for your business and your cooperation.

by Pam.

## What's Going On Out There

Damage during shipment of items  
returned.

In a few instances in the past we have received units back for repair that were sent to us with boards plugged into the chassis only. Without the case top and bottom, the chassis has very little protection. The postage for the weight of the case top and bottom is not as costly as the damage done to the unit occurring during shipment. We hope that by informing you of this problem, costly labor and special handling charges will not have to be passed on to our customers sending such units back. We thank you for your attention to this problem.

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## PUZZLE

contributed by

R. O. Whitaker, Engr.

Q1. A man starts at the point where the prime meridian crosses the equator and walks 45° Northeast, constantly checking the direction of his route using a geographic compass which always points toward the North geographic pole. Provided the man walks with equal facility on land and water will his journey ever end? If so, where? If so, how many kilometers will he have travelled when he gets there?

Q2. A man bound for Albuquerque (to buy an Altair computer) arrives at a crossroads where a filling station is located. He does not know which road to take. He knows that every station operator is either an absolute liar and always tells a lie or is perfectly honest and never tells a lie. What single question can he ask the operator that from the answer he can determine which road to take?

Q3. Which character in the following sequence is out of order?

A1. He spirals to the North pole. Arriving after traveling a distance of 10,000,000 2 meters. This distance because the meter is defined as 1/10,000,000 the distance equator to pole and for each increment he travels along his path, he travels 1/2 straight north.

A2. "Which road would you say leads to Albuquerque? The man then takes the road designated by the operator.

A3. Eleven. This set of digits for a base-16 numbering system (or something very nearly equivalent to it) was proposed by a Mr. Gabrielian of Newport Beach at a recent Computer Arithmetic Conference.

## New PCC Publication

"Tiny BASIC"

TINY BASIC is about building your own BASIC and--maybe--it might grow into a publication about learning how to build your own software for the home/school/personal computer. We will publish ideas and software in the public domain for anyone to use. TINY BASIC will be a sharing thing with explicit permission to use the information in a non-commercial way. We will start modestly, promising 3 issues over the next few months. Bernard Greening is the editor of TINY BASIC with help from Dennis Allison and whoever wants to help.

TINY BASIC, Volume 1. Three issues for \$3. First issue: January 1976.

Send to: TINY BASIC  
PO Box 310  
Menlo Park, CA 94025



## Goats and dancing?

## Blousemaker rips seams over business mini

By Donald Silverman  
Minicomputer News

Business acquaintance named Thornton went seeking a computer system. Simple set-up to handle tasks like billing, payroll, and perhaps some inventory control. Straightforward work for a business system, you'd expect. Especially in a small business like Thornton's (he makes women's blouses).

Few days ago I saw Thornton, normally a light drinker, tipping heavily at the Ritz's cocktail bar.

"Thornton, what a surprise to see you here," I said, surprised. "What could possibly have driven you to drink like this?"

Thornton looked up at me. He slowly put down the Chivas Regal on the rocks he was about to gulp down. Thornton reached out to me as if for support, then said: "What am I, the only one that's crazy?"

"These computer guys!" Thornton continued. "Oy, what a bunch! Go buy a computer from them! Like I know from computers like I know from . . . what? Nuclear physics?"

Thornton paused, as if he were waiting for my answer. But he continued, "So what happens?"

He paused again, looked around the room and pulled me close to him.

"One guy," Thornton started off quietly, "he carries on for hours with junk like RAMs and PROMs and who knows what else? Oh, a *big deal* he makes of them. *His* system, he says, comes with this kind of RAM, that kind of PROM.

"So what's with this ram and prom?" I ask. "You need goats and dances to run computers?"

"All right, so maybe I was pulling his leg a bit. But I need this RAM, ROM PROM junk? I need to worry what makes a computer work? I got worries enough how to make a blouse that sells. I need computer headaches?

"Then I run across Marvin, the *big* engineer. With Marvin you don't just *buy* a computer. Oh, no! With Marvin you understand every tiny detail on what makes it work or you don't buy.

"A number one head, this Marvin. Degrees from MIT, from this school, that school, institute of this, institute of that. You name it. But a salesman? With Marvin selling my blouses I'd go broke in a day. With Marvin you wouldn't just *buy* a blouse. You would have to know how the cloth was made, how the sewing machine works, why one button costs more than another button. A woman needs this? Look, a blouse is a blouse. Some are simple, some are fancy. If it fits, you buy it.

"Even so, Marvin was a big help. He was the one who helped me understand computers. Not everything. But enough so I wouldn't get scared every time I hear words like bit and bite. (Marvin spelled that b-y-t-e, like a fancy Englishman.)

"A bit he explained is a zero or a one. And a bite? That's just a bunch of zeroes and ones. The more bits and bites you put into a computer, the more money you got to pay. So now I understand. You bite off a bit of a bite and you end up with a bit.

"Look, Marvin," I said. "I appreciate all you're trying to do for me. But tell me something. So far your computer doesn't seem any different from anybody else's computer. In what way is your computer so different from all other computers?"

"Oy, vay! A tornado I unleash. Suddenly Marvin is fuming and frothing and saying things like speed and access and input and output and faster and real time.

"Marvin, Marvin, Marvin," I shout out. "Slow down, my child. You say your machine is faster? Okay, so how much faster?"

"Then Marvin, instead of telling me how much faster, he tells me his problems with seconds. 'Look, Marvin,' I said, 'don't tell me from *your* seconds. I get enough seconds from *my* Millie's. You know what it's like to find a good stitcher nowadays? You know what it's like to try to turn out quality at a price when nobody wants to work anymore?"

"From Marvin I go to Stanley. Stanley, a super salesman. What a peach. A real gem. Smooth talker. Smooth looker. He tells me not to worry about bits and bites and RAMs and ROMs and this and that. Don't worry. All I should do is tell him my *problem*, he'll give me a solution.

"So I tell Stanley I got billing to do. I got a payroll to worry about. I got an inventory that's costing me an arm and a leg. And Stanley, the smooth talker, pulls out a catalog. Thumbs through here and there. And comes up with a computer for me.

"Then he takes me into a showroom. And he shows me *my* computer.

"Stanley, it's a beautiful machine. And you're sure it'll do the job for me?" Oh, he assures me up and down. So I look it over and I'm ready to sign on the dotted line when suddenly I notice something. 'Hey, Stanley,' I say. 'Just so I'm sure I know how it works and can explain it to the girls in the office, where is it I put my invoices to be typed?'

"Stanley stares at me like I'm crazy or something. He mumbles something about he's in the computer business not printers. If it's a *complete* package I want, I should go to a systems house.

"A *what* kind of house?" I yell at the bum. 'Me, a reputable businessman?'

"So then Stanley, the bum, explains to me what it is, a system house. For people like me, who all we want is to

**"If you had to buy a car like you have to buy a computer, we'd all be riding around on horses!"**

get a computer and everything else ready to go, then we go to a systems house and they deliver us a turkey system. Why they should call it a turkey, I don't know. But I should argue with a billion-dollar computer industry?

"Finally I say to myself, 'Thornton, you're finally getting somewhere. All you should do now is find a good systems house and you get a computer.'

"First thing happens I walk into the systems house, they want I should tell them which applications package I want. A what package? Applications? I don't know applications from apple strudel.

"I tell them I got a little billing, I got a little payroll, I got accounts who haven't paid me in 90 days. 'Fine,' they say, 'we can fit you out with our *standard* small business package.' And then I tell them I got inventory headaches. 'Aaaah!' they exclaim. 'It's no longer a *standard* package but a *custom* package. Cost a little more, but *not* to worry.'

"Fine," I tell them. 'Do it. And how

much will it cost?"

"A runaround I get like I never got before. They look at me like I said a dirty word. They tell me 'it' depends. 'It' depends on how much of this I want? 'It' depends on how much time they need. It, it, it. Like to say price or money or cost is somehow obscene. Like you can't give me a firm price before I buy? Like when a store wants a custom blouse, I should't give them a firm price before they order? I'm supposed to say 'it' depends on how long my cutter takes, how long my stitcher patzkies around, how long my shipping clerk takes?"

"What a business, this computer business. If you had to buy a car like you have to buy a computer, we'd all be riding around on horses."



## Thornton's tale, part 2

When business acquaintance Thornton unfolded his tale of woes in buying a business computer, I thought that surely he was exaggerating. After all, all he wanted was a simple set-up to handle straightforward tasks like billing, payroll and inventory control.

Nevertheless, Thornton, while nursing another Chivas Regal on the rocks at the Ritz's bar, insisted on his tale's veracity.

"I should lie to *you*?" he said. "I should tell you I got troubles when I got no troubles?"

"Perhaps," I suggested, "there's something unique about manufacturing blouses, something that makes it less amenable to computerization than, say, manufacturing electronic parts."

"Aiiiii," Thornton moaned. "If only I did make electric parts. At least I'd be making a decent living. You know what the mark-up on blouses is? You know what I got to go through just to break even?"

"Blouses? Making blouses is so different from making anything else? Somebody makes it, somebody sells it, somebody buys it. In between, there's a lot of headaches, a lot of sweat and believe *me*, a lot of aggravation. You got workers you got to pay more than they're worth. You got stores who make you wait 60, 90, 120 days before they even *think* about paying you. You got suppliers who say they'll supply you at one price and then supply you at another price and tell you you don't like it, don't take it.

"What's so different? Look, every businessman, he's got the same problems. Even the computer people, they got problems. And I can sympathize with them.

"But they should sell computers like they sell cars. You go into a dealer, he shows you what he's got, he tells you the price, you pay him what he wants — all right! so you discuss it a little — and you drive off.

"But computers? I told you before, if Detroit sold cars like computer people sell computers, we'd all be riding horses. And we'd be a lot happier, believe me.

"First of all, you just wouldn't buy a *car*. You'd buy something with a fancy name like 'vehicular system.'

"Or," I interjected, "an interactive modular component of a point-to-point, surface transportation system."

"And you think you could just go into a dealer and buy a complete package?" Thornton continued without pause. "You think so, you're crazy. You'd have to go

there for tires, over there for upholstery, and over there for a horn. Why? I'll tell you why.

"Because the automobile dealer, he would say, 'I supply automobiles. I *don't* supply accessories.' Big shot! Hoo, hoo, hoo!

"I want tires, accessories — or what is it the computer people say? peripherals? — to a tire dealer I have to go. I want a radio, I should see a radio dealer. I want a steering wheel, I should see a steering wheel dealer. I want a bucket seat, I should see a bucket dealer.

"And I should be able to go into a showroom and say, 'Look, I need a car that can take me from here to there?' No, I would have to know *why* it can take me from here to there. I would have to know *how* it can take me from here to there. I should have to know how much gas flows through here. I should have to know how much oil flows through there.

"And all I want to know is, can it get me there? If it gets me there, with a little bit of style (you know, a seat that doesn't make you feel you're sitting on a piano bench, a little air conditioning, an engine that maybe at the lights lets you show off a little), I take it. I have to know how the gas gets from here to there? I have to know the engine is turning around a thousand times a second? I should care it turns? I should care how much it *costs* me every time it turns.

"I remember when Marvin, the computer genius, is telling me about two key this, four key that, eight key this, key that, key this. And *me*? I'm holding my head, and I'm crying, 'Oy vay, oy vay, oy vay!' And Marvin is going, 'Key, key, key.'

"Later, I find out it's not key, it's K and K means a thousand. So why can't he *say* a thousand. Like you buy a car with a 4K RPM motor? No, you buy a four *thousand* RPM motor. And why? Because automobile dealers speak English.

"Besides, where does this K come from? In grammar school, in *grammar* school already, I learn the abbreviation for a thousand is M. M, from the Roman numeral, not K.

"And when I buy a car, do I have to sit down with a hundred-page catalog and study it like I was a scholar? I have to sit there with tables this long and match this (what do they call it? module?) *part* with *this* part. I have to go into an automobile dealer and spend hours telling him what I need and why I need it, and then he tells me he'll give me only so much of the car and if I want ash trays I should go to the ash tray maker?

"No, I go to buy a car, and it's already set up to get me from here to there. So it's got a little more horsepower or a little less horsepower than maybe I think I want. That's such a big deal? The important thing is that I don't have the aggravation of worrying how to set the car up so it'll get me from here to there.

"And you know why? Because the automobile people are smart. They know what people want. They say here's a car for you, you want a little extra trim, fine, you don't want it, fine. Whatever you want, it's ready to go. So it's got a little bit more than I want? What's the difference? The time I save in aggravation, it's worth the price.

"You have to understand. All I want when I buy a car is I put in the key, I turn the key...and it runs. I don't have to change the way I do business. I don't have to turn my factory upside down. I don't have to wait for somebody to show the car how to run. And I don't have to hire a special key turner. So, is that asking too much?"





*First Annual*

# WACC!

## World Altair Computer Convention

This year's most exciting computer convention could very well be the First Annual WORLD ALTAIR COMPUTER CONVENTION. Computer hobbyists from all over the World will gather in Albuquerque, New Mexico on Saturday and Sunday, March 27 & 28. Many of them will be bringing their Altair systems in order to compete for the \$10,000 worth of Altair equipment to be given away at the convention. In addition to demonstrations of Altair product applications, there will be FOUR SEMINARS presented during this dynamic weekend.

**SEMINAR ONE** will be a seminar on LOW COST COMPUTING conducted by some of the leading figures in the field. A preliminary list of speakers includes Larry Steckler, technical editor of Radio Electronics, Carl Helmers, editor of Byte magazine, Art Childs, editor of Interface magazine, David Ahl, publisher of Creative Computing, Judge Pierce Young, president and founder of the Southern California Computer Society, and Terry Silver, also of the SCCS. And this is only the beginning.

**SEMINAR TWO** will be a complete discussion of ALTAIR PRODUCTS and Altair design philosophy. Speakers will include H. Edward Roberts, president of MITS, Inc.; Project Engineers Bill Yates, Bob Zaller, Tom Durston, and Pat Goding; Software Writers Paul Allen and Bill Gates; and Computer Notes editor, David Bunnell.

**SEMINAR THREE** will be a presentation of the updated MITS TRAVELING SEMINAR presented by Pat Ward. Altair technical binders will be given away free to people attending this seminar.

**SEMINAR FOUR** will be an organizational meeting of the Altair Users Group conducted by Barbara Sims and David Bunnell. Topics will include organization of the Users Group and ways to improve MITS service to Altair users. All seminars will be opened to the audience for questions.

Attendance to the WORLD ALTAIR COMPUTER CONVENTION will be **free to all Altair owners and out of town guests**. The convention will be held at the new MITS building at 2450 Alamo SE, within walking distance of the Albuquerque Airport Terminal. The entire Airport Marina Hotel has been reserved for this occasion. Reservations at this hotel (which is also within walking distance of MITS and the Airport Terminal) can be made by filling out the coupon in this ad and returning it prior to February 26. Cost of reservations are \$20 per night for a single and \$24 for a double.

# \$10,000

MITS will be presenting door prizes and prizes for the best demonstrations at the convention. These prizes will include Altair 8800's, Altair 680's, and related equipment of a retail value not less than \$10,000. To enter in this contest or to have a booth at the convention, you must fill out an official application form from MITS, Inc. Rules and regulations governing demonstrations and booths are available with application forms.

### ALTAIR CONVENTION COUPON

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State &amp; Zip \_\_\_\_\_

☐ Yes, I plan to attend the first annual WACC to be held in Albuquerque, New Mexico on March 27 and 28, 1976.

☐ Please reserve a room for me at the Albuquerque Marina Hotel. I will need a ☐ single ☐ double room. I plan on staying in Albuquerque the following nights: ☐ Friday ☐ Saturday ☐ Sunday.

☐ Please send me the official entry form for the Altair Demonstration Contest.